Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/490
SPAIN
February 1964
Original: SPANISH

Confidential until official release during Conference

Abstract

RESEARCH ON COMMERCIAL MIXTURES OF HYDROCARBONS FOR USE AS MODERATOR-COOLANTS IN REACTORS

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During the first phase of this programme, a study was made of three commercial mixtures of terphenyls (PROGIL OM1, OM2 and OMP) and three mixtures of partially hydrogenated terphenyls (MONSANTO HB-40 and HB-20 and PROGIL OMP-H). The tests were mainly concerned with studying the thermal and radiation behaviour of these substances and investigating the effect of thermal and radiolytic damage on their principal physical properties.

Information was obtained on the thermal-decomposition kinetics of polyphenyls by means of static pyrolytic tests carried out at various temperatures between 400 and 500°C. The following determinations were made as a function of temperature for various materials: the initial formation rate of different gases (hydrogen, methane and other homologous hydrocarbons); the initial formation rate of liquids and solids possessing greater volatility than the original components (benzene, alkyl benzenes, cyclohexane, biphenyl, alkyl biphenyls, etc.); the initial formation rates of polymers; and the initial disappearance rates of the starting compounds. For this purpose, the kinetic orders of the thermal breakdowns were determined and the corresponding activation energies were recorded. In each case, variations in density, viscosity and melting point were studied as a function of polymer content or other decomposition values.

Parallel radiolytic studies, also static, were made with electrons accelerated (1 MeV) in a Van de Graaff generator. Results for this work are still incomplete so that no definite conclusions can be drawn.

On the basis of purely pyrolytic data and relative values for fabrication costs, the paper indicates provisional criteria applicable to the selection of the materials tested.